SCIENCE

NEW SERIES
VOL. LXI, No. 1572

FRIDAY, FEBRUARY 13, 1925

ANNUAL SUBSCRIPTION, $6.00
SINGLE COPIES, 15 CTS.

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VOL. LXI FEBRUARY 13, 1925 No. 1572

SCIENCE: A Weekly Journal devoted to the Advancement of Science, edited by J. McKeen Cattell and published every Friday by

THE SCIENCE PRESS

Lancaster, Pa. Garrison, N. Y.

New York City: Grand Central Terminal.

Annual Subscription, $6.00. Single Copies, 15 Cts.

SCIENCE is the official organ of the American Association for the Advancement of Science. Information regarding membership in the association may be secured from the office of the permanent secretary, in the Smithsonian Institution Building, Washington, D. C.

Entered as second-class matter July 18, 1923, at the Post Office at Lancaster, Pa., under the Act of March 3, 1879.

THE EQUINOX OF 1950.0[1]

IN every science, in all human progress, there are dividing boundaries, epochs, milestones, marked in no regular fashion nor by equal intervals of time, but by discoveries. Not infrequently it is the life work of some group of men, or the individual contribution of some surpassing intellect, which forms the zero year from which we date a particular epoch in scientific progress. Though the historian of science, a thousand years hence, looking back upon our era may feel sure that the advancement of present science is a continuous function, with few singularities, multiple points or imaginary roots, to those who now take part in this work it frequently seems as though the increase in our knowledge is discontinuous and saltatory. Instead of an evolution progressing by infinitesimal variations in our scientific characters, inherited or acquired, we are ourselves so close to the astounding events of present progress in the physical sciences that we feel rather that we are undergoing an evolution based upon sudden mutations.

Astronomy has similar apparent epochs of sudden mutation, marked by men or processes—the ages of Newton and Bessel, the eras of the meridian circle, of photography, of the spectroscope. Each has marked a tremendous advance, *per saltum*, progress which has seemed to the scientist of each era to be by leaps and bounds rather than by the slow accretions of natural growth, discontinuous rather than continuous. We are prone to forget, in such a view, the minor contributions which have made the road ready, and time has a way of running a relatively smooth curve through the irregularly plotted points. No lapse of time, however, will ever entirely smooth out this always ascending curve; it may always have sinuosities, overtones of the main great harmonic. Perhaps it is sufficient for us, as we contemplate our section of this great graph, to leave to time the smoothing out of the curve of our present progress, while we derive satisfaction, pride and hope from the fact that the curve is definitely ascending.

More than one dreamer, combining mathematics with fancy, has drawn attention to the supposed parallel between the curve of progress and the hyperbola referred to rectangular asymptotes as axes. Sweeping down from infinity, this curve as ordinarily drawn at first makes tremendous and rapid progress

[1] Address of retiring vice-president of Section D, Astronomy, of the American Association for the Advancement of Science, Washington, December, 1924.

toward its goal, the other asymptote. But gradually its rate of approach slows down, and finally aeons must elapse before the curve becomes appreciably closer to its parallel running aim. Such speculations dwell upon the slowness of research and upon the difficulty in making real additions to our sciences where all the really worthwhile discoveries were made when the world was new and all. But, to take only one science which is daily becoming more and more indispensable to my own, who can consider the results in physics secured during the past quarter century as falling on such a curve, as showing any falling off in power or in truly apocalyptic revelation? We must, it seems, rotate this curve ninety degrees accurately to represent our graph of progress. The curve has risen slowly, for a time almost infinitely long; now the rate of progress is increasing faster than the mind of even the specialist can follow; though we shall never reach the asymptote of absolute knowledge, our rate of progress is becoming increasingly rapid. We can forego an actual entrance into heaven, provided only that new discoveries shall infinitely continue to reward our toil!

More fortunate, perhaps, than its sister sciences, astronomy possesses also certain very definite milestones, unlike those epochs which are dated from men or inventions in that they regularly recur. The twenty-five thousand year long rotation of the axis of the giant gyroscope on which we live, which we call precession, and the nineteen-year-long nodding of our pole as it makes this gyration, which we call nutation, and other minor causes, make troublesome changes in the apparent position of that sky which is our field of work. So it has become convenient, and hence the custom, in the astronomy of position, perhaps the most fundamental portion of our science, to refer all charts, maps and positions, not to the slowly shifting equinox of the date when the observation is made, but to the equinox of some fixed epoch at the beginning of a year not too remote in point of time in either direction. Most of our great celestial inventories made in recent years are accordingly referred to an equator and an ecliptic as they were for an instant at the beginning of the year 1900, and any star positions which we publish or quote generally have after them these figures in parentheses, indicating that the positions are referred to the equinox of 1900.0, though we are certain that all the data are different now. Some have suggested the equinox of 1925.0 as a convenient mid-epoch, but it seems more probable that we shall begin now to refer all future data to the equinox of 1950.0 as our next zero year. Considerable thought has been given by astronomers as to the optimum frequency of these quasi-celestial milestones of reference. An interval of a century is certainly too long, and many feel that a quarter of a century multiplies unduly the number of such epochs. Probably the majority of practical astronomers would prefer half-century equinoxes, and it seems highly probable that the equinox of 1950.0 will be set aside as the next reference epoch of the astronomy of precision.

My own work as an astronomer, after a youth not misspent in the classics, started at our last astronomical reference epoch, that of 1900, and the work of many members of our society began a decade or two before that. We have seen a wonderful quarter century of progress in our own and in the allied sciences; many of us will not welcome in the equinox of 1950.0. There are many precedents to the effect that a retiring vice-presidential address should be devoted to a survey of recent progress and achievements; not infrequently the events of but one or two years preceding will give far more than enough material to discuss in the time allotted. But I have preferred to look forward, rather than back. What then are some of the things we may at least hope shall be added to our astronomical inventories of the equinox of 1950.0? Prophets, in science, are generally without honor in all countries as well as in their own, but prophecies must always be based in part upon the past and are, to that extent at least, illuminating.

The equinox of 1925.0 finds the astronomer practically driven off the earth by the meteorologist, the geodesist, the physicist and the seismologist. After the discoveries of the past decade, it would be futile to attempt to prophesy anything for the physicist, and we may safely leave to these fields of science the advances to be made in the coming twenty-five years in the knowledge of our earth. The variation of latitude appears to be a field where all branches may contribute, and to be almost the only part of earth-science where the services of the astronomer are still needed; it seems probable at present that the equinox of 1950.0 will report on this phenomenon as still consistently irregular. We may hope for a somewhat more accurate knowledge of such phenomena as the aurora, for refinements in our theories of earth rigidity, the tides, isostasy and the conditions obtaining in the earth's interior. Our theories of the causation of the ice-ages are now more local than astronomical and may so remain.

I hesitate to function as a prophet when touching the subject of possible advances in instruments or methods. Some new method may change the picture as completely as the spectroscope has differentiated the astronomy of 1925 from that of 1825. To take but one example: let us dream of a dry plate one hundred times as sensitive as the most rapid which we now use, ideal as to "grain" and keeping qualities,

and with a uniform range of spectral sensibility from the ultra-violet to the infra-red. This is a wonderful dream; perhaps we may get such a plate in heaven! Such a discovery, or rather advance, would have the same practical effect on astronomy as to replace the 36-inch telescope of the Lick Observatory with one having an object glass thirty feet in diameter! The cycle just past has seen the construction of the Mt. Wilson 100-inch, the Victoria 72-inch, and a number of other noble instruments. Shall we have any larger reflectors by 1950? While many believe that the refracting telescope has reached its maximum efficient size at 40 or perhaps 48 inches, the limit for a reflector is theoretically about sixteen feet. But here, rather than upon the optician's skill, we shall doubtless be more dependent upon the glass-maker's ability, as well as upon the results of income and inheritance taxes in cutting down bequests for scientific research. We may confidently look forward to great extensions in the use of the photo-electric cell and the interferometer, and it will be very strange if the wonderful delicacy of the vacuum tube is not soon utilized in astronomical research.

In extrapolating the curve of astronomical progress for the coming period which will end in 1950 we can, in most fields, do little more than continue the tangent to the present curve. If this has risen but little in the past quarter century, its slope can be expected to increase in the coming epoch only through the introduction of new processes or through discoveries whose nature can not be predicted. Reasoning thus from the past, it seems probable that the equinox of 1950.0 will show but little more than that of 1900.0 in our knowledge of the surface features of the moon and the planets. To clear up the problem of the small outstanding irregularities in the motion of the moon we shall need a century of observation, in all probability, rather than twenty-five years, though five may suffice to compare with the new tables of Brown. In so far as unanimity of astronomical opinion is concerned, it is doubtful whether our knowledge of the surface features of Mars is much more definitely established now than it was in 1900; we may perhaps hope that 1950 will see some reasonable measure of agreement as to the canals of Mars, either for or against.

Were we to select the two most important advances made in the field of cometary research in the past quarter century, our choice would doubtless be, first, the completion of the researches of Strömgren, Fayet, and others, definitely establishing the fact that the comets are bona-fide members of our solar system, being wanderers from outside space in possibly only the rarest of cases. The second selection would doubtless be the advance due to Fowler, in identifying carbon monoxide as an important constituent of cometary tails. We have had no bright comet in the past fifteen years; from the law of averages pertaining to such bodies, it would seem reasonably probable that we may expect one or more bright comets before we have passed our next astronomical milestone, enabling further spectroscopic advances to be made.

1950 will see the number of the asteroids doubled or tripled; the problem of keeping track of the thousand odd we now know has become so serious a one that it may well be that the councils of 1950 will decide that the labor and the rewards are no longer commensurate, that the greater number of the asteroids must be abandoned as soon as possible, leaving only a few of the more interesting objects or types to be systematically followed. The work of discovery will probably continue unabated for a time, as a few asteroids of the Eros type will be worth a thousand of the more mongrel varieties. But this work of discovery can be carried on efficiently only so long as rough ephemerides exist for all asteroids previously discovered, and the time is coming when this task will become too costly and too time-consuming, unless some such graphical perturbation machine as that of Sundman can be constructed to grind out asteroid orbits and their perturbations much as we now grind out tidal tables.

At this midway point from the equinox of 1900.0, there seems to have been secured no more important recent result in the field of space outside our own minute solar system than the confirmation beyond all doubt of the fact that our sun is an average star, roughly at the middle point, so to speak, of our various schemes of stellar evolution, and apparently quite near the general average, also, in its size and in its intrinsic luminosity. As is well known, this deduction works both ways; like most important generalizations, it is Janus-faced. We have in the stars important lines of evidence bearing upon the constitution and upon the evolution of our sun. And in that nearest star which we call the sun, we no longer have to deal with a datum compressed angularly almost into a mathematical point, but we have a star close enough to us to offer us a superficies which, while almost too remote for some of our researches, still permits us to concentrate our studies upon some portion, some detail, of a star's surface.

It is perhaps too much to hope that the equinox of 1950.0 will see the solution of more than a very few of our many at present unsolved solar problems. It now seems evident that in the average star we have a wonderfully complex interweaving of forces and conditions in large part of unknown character, and with this complexity a truly marvelous balance and permanency. Perhaps the best proof of the balance

of forces which must exist lies in the fairly well established truth that our sun can not, for any very long period of time continuously, have varied its heat emission by as much as five per cent. during the past two hundred million years. We have come to believe that the life period of a star is of such duration that it may almost receive the adjective eternal; certainly a matter of trillions, rather than millions of years. At our last semi-centennial equinox we should have spoken with all certainty as to the method by which the heat emission of the sun is maintained. We felt that in the contraction theory of the sun's heat we had a rigorous mechanical and dynamical explanation, mathematically exact; following these apparently rigorous proofs we were at that time unwilling to allow more than a mere trifle of one hundred million years or so for the sun's past life, and somewhat less for its future. Increased knowledge frequently brings an uncertainty far less comfortable than the preciseness of ignorance. The astronomer is now willing to grant the geologist and the biologist all the time they need, even all the time they wish. But with this new-found generosity in the time factor, we now are forced to admit our doubts as to the precise mechanism of the output of solar radiation; we conveniently ascribe it to some manifestation of sub-atomic energy; though we know very little about this, we at least feel sure that there is enough of it to last over the most leisurely geological or evolutional cycle upon cycle. The astronomer assumes no undue measure of credit for this deduction, inasmuch as he is forced to adopt it through a rather elementary *reductio ad absurdum*. There seems at present nothing else to explain the sun's tremendous output of energy except sub-atomic forces; therefore, these must be the source.

Omitting eclipses less than two minutes in length, or probably not usable for other reasons, there will be nearly 41 minutes of totally eclipsed sun between now and the equinox of 1950.0. Of course, not all these forty-one minutes will be clear, but when it is remembered that we have had to date, which means practically since the introduction of the photographic dry-plate, only about forty-eight minutes available for eclipse work, it seems evident that the equinox of 1950.0 may see some material advances in our knowledge of the sun's surroundings. Further work is to be expected on the rotation of the corona. The mysterious so-called element coronium still baffles us. There seems no reasonable and logical gap for it among our ninety-two sorts of matter. Very probably it is some as yet unknown spectral manifestation of hydrogen, helium, or calcium; but which? At least three attacks on phases of this problem are planned for the coming eclipse of January 24, by interferometric methods, and with different instrumental equipment, in the attempt to throw some light on the nature of coronium. We remember that helium was first seen and named in the sun, only to be identified terrestrially a quarter of a century later. Perhaps the physicist will outstrip the astronomer in solving the problem of coronium, just as he has lately opened up entire new vistas of research and explained many difficulties in solar and stellar spectra through the investigation of ionization phenomena.

While the next quarter century may not see the full solution of all pending solar problems, it will bring at least the collection of much more extended series of observational data. With this will doubtless come a fuller understanding of such questions as the precise law of the solar rotation, the mechanism of solar convection, electrical concomitants of sunspot activity and of high and low level phenomena. Programs for the more precise determination of solar wavelengths are even now well under way. Whenever, in physics or in astronomy, our results enable us to advance one decimal place to the right, a host of interesting by-products, even complete new fields of research, are at once forced upon our older knowledge. I look for most interesting developments as immediate sequelae of a more exact knowledge of solar wavelengths.

Tennyson put an old truth in beautiful form when he wrote:

> . . . . . Yet all experience is an arch,
> Wherethrough gleams that untraveled world,
> Whose margin fades forever and forever as I move.

True for every intellectual advance, this seems doubly true as applied to present tendencies in what may be termed galactic or cosmological astronomy. The scale of our accessible universe has been steadily expanding. Referring to the details of our own Milky Way, we are now using units of a thousand light-years with the ease of familiarity. Similar in form to our own galaxy of stars, many of us believe that the spirals are likewise galaxies of stars, other Milky Ways. Like our own, their diameter is to be measured by tens of thousands of light-years; like our own again, each may contain a billion or more suns; their distances from this local Milky Way of our own are of the order of a million to a hundred million light-years. Astronomy alone of all the sciences can study, in the present tense, manifestations of energy coeval with our remoter geological epochs.

We appear to have, in a vast and all-embracing continuity, a super-system of Milky Ways, and that Milky Way of which our sun and his system forms perhaps but one billionth part is itself but a moiety in the larger scheme. It seems difficult to predict

or even to imagine any considerable extension of this mighty concept.

We may hope, however, that the equinox of 1950.0 will see accumulated a vastly increased store of the observational material from which may conceivably be derived much more accurate data as to the scale, shape and structure of our own galaxy. The problem is so vast a one that we shall have scarcely made more than a beginning in the next twenty-five years. For we have in our galaxy a billion or more separate units available for study. Fortunately, there seem to be only four or five main genera of celestial objects, with fewer than one hundred species which we can distinguish at present. Most of our ethics, religion, philosophy and theory of civilization is based upon the average man. In astronomy at present some of our conclusions are based upon correlations made from quite limited numbers of special types of celestial objects. In some cases such methods are the only ones yet available. But it is perhaps reasonable to assume that in the coming astronomical cycle we shall depend more and more upon the average star, that the average celestial citizen, so to speak, will come more and more into his own. For we may hope for relatively vast additions to our data bearing on the motions, distances and intrinsic luminosities of the stars within the next twenty-five years, and our most certain data will inevitably come from the average star. In this respect, I have seen no reason to change a published statement of my own, made four years ago:

> It would appear, also, that galactic dimensions deduced from correlations between large numbers of what we may term average stars must take precedence over values found from small numbers of exceptional objects, and that, where deductions disagree, we have a right to demand that a theory of galactic dimensions based upon the exceptional object or class shall not fail to give an adequate explanation of the usual object or class.

Mutatis mutandis, I feel that the day may come when, for that portion of the greater universe beyond our Milky Way which is now accessible with our largest telescopes, our most reliable data will be based upon what we may term the "average galaxy."

In our collection of the data bearing upon the characteristics of the average star there are still great gaps in the skies of the southern hemisphere. It is now nearly a century since Herschel journeyed to the Cape to continue celestial surveys by the knowledge then available. Later, Harvard continued and extended the great work it had done in the northern hemisphere by establishing its station at Arequipa, in Peru. The beginning of our last semi-centennial equinox period was marked by Campbell's extension of his great radial velocity survey to the southern stars, from the Lick branch station at Santiago, Chile, and soon after came the work of the station of the Carnegie Department of Meridian Astronomy at San Luis, Argentina. A solar physics observatory has just been founded at Canberra, Australia. In this mid-year 1925 Schlesinger and Hussey will go to South Africa, the former for the determination of the distances of southern stars, and the latter to extend to that portion of the celestial sphere his search for double stars. There is still a large gap to be filled in the photography with large reflectors of those nebulae inaccessible from our northern observatories, though a good beginning has been made in this field by Perrine at Cordoba.

At a distance of five hundred light-years the probable error of our best direct parallax determinations is about equal to the distance we are trying to determine. There are still occasional disquieting differences between such direct determinations and the distances determined from the star's spectral type by the ingenious method of Adams. For the comparison and perfecting of the two methods, there is still a large field of work for the direct photographic determination of stellar distances; we look forward to a continuation of our photographic parallax work at Allegheny Observatory for at least ten years, with the probabilities strongly in favor of its continuance until 1950. But certainly before the equinox of 1950.0 we shall be able to determine by the spectroscopic method the average distance of large numbers of faint stars of all spectral types with all desirable certainty and at distances of thousands of light-years. Then, with stellar distances no longer dependent upon the base-line between the earth and the sun, we may perhaps hope for the relegation to limbo of the monstrous and unnecessary hybrid word "parsec."

The astronomy of pure position needs a very generous time element, and the twenty-five year interval between this date and the equinox of 1950.0 is doubtless too short for great additions to the solutions of its various problems. But the work of Albany and San Luis will shortly add very materially to our stock of proper motion data. We may confidently hope, too, that we shall see at last, before 1950, the completion of the great Carte du Ciel, so that we can begin it all over again, and by repeating this tremendous program eventually secure an enormous mass of motion data.

I must relegate to some leader in physics any prophecies with regard to the status of the theory of relativity at the equinox of 1950.0; this in spite of the fact that the three so-called proofs of the theory have been borrowed from the astronomer. Though not accepting the theory as either necessary or inevitable, I may perhaps be permitted to outline what

seems to me to be the duty thereto of the astronomer in the quarter century which is before us. The non-Euclidean geometries of Bolyai, Lobatchevski or Riemann are beautiful mathematical structures; they are internally self-consistent and logical. Provided only we assume a mighty enough "curvature," any of these systems can be made to "fit" our physical universe. It has been suggested, though doubtless not very seriously, that the reality and the inevitableness of such non-Euclidean systems could be proved if we could show that the sun of the angles of the triangle formed between our sun and two very distant stars is very slightly different from two right angles. Like the systems named, the theory of relativity is beautiful, internally self-consistent and logical. It would be as futile to argue against it by deducing peculiar consequences or apparent paradoxes in it as it would be to argue against non-Euclidean geometry. Many relativity frameworks are doubtless possible, and any one of these may conceivably be inevitable and necessary, though, following Poincaré, we shall generally choose that system which is simplest. Science, and some would say even government, ethics and religion, is pragmatic. There is but one test of a system; does the system "fit," and can the "fit" be explained only by the system and no other? The line of action thus laid down for us by the theory of relativity is accordingly very simple and direct. We must test the three proofs adduced from astronomical evidence in every possible way. Our criteria will be, first, is the evidence valid, and, secondly, is it impossible to explain it in some apparently simpler way by what we term classical mechanics.

As a by-product of the Allegheny solar wavelength program, Burns and Meggers, by methods which can detect a shift ten times smaller than that predicted by the Einstein theory, find that the shift of the solar lines to the red is far different from the simple and uniform shift postulated by the theory of relativity. They find that amount of shift to the red is a function of the intensity of the solar spectrum line, the finest and sharpest lines being shifted not at all. It seems impossible to find support for the theory of relativity in these results. Others are attacking the same problem, and doubtless programs of investigation are even now under way with regard to the two other proofs, namely, the anomalous motion of the perihelion of Mercury and the observed deflections in star positions photographed near the sun at total solar eclipses. The duty lies upon us of exhaustive investigation of these astronomical apparent evidences. The predicted shift of the spectrum lines to the red is apparently non-existent as a direct result of the theory of relativity; only if future work fails to find explanation for all three proofs shall we need to regard Einstein's theory as both necessary and inevitable. Our course of action seems thus clearly and definitely marked out for us; we must do the work leaving, perhaps, the final summing up and the definite decision as to the validity of this important theory to the astronomer and the physicist at the equinox of 1950.0.

HEBER D. CURTIS

ALLEGHENY OBSERVATORY
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RESEARCH IN COLLEGES

WE will start with some self-evident propositions, which apply to the colleges.

(1) The *first* function of a college is to teach its students.

(2) Through its faculty, the college has responsibilities to the community, as in making books, public lectures, assisting civic organizations, industries and in religious work.

(3) The college also has a duty to extend the bounds of human knowledge.

These three overlap, for research should be of benefit to teaching and it *is* teaching when students are taught research, and simply the sight of research going on is educational. Moreover, through research we meet our most important obligation to the community.

Is research not better left to industry or to the universities? The object of business is to make money, while the object of our schools of learning is to obtain the truth, which we must have if we are to teach. Research is, therefore, a primary function of our colleges. The university and the college can not be distinguished on the basis of interest in the truth. Formerly the search for the truth was a function of the church, but it has handed it over to the colleges. Colleges past the pioneer stage can have no reason for evading their responsibility in finding out the truth. Since the churches have given over the search for truth, it is all the more important that the colleges, many of them denominational schools, should carry on in order to pay back the debt which they owe to the church from which they draw support; woe to the church which forever remains content with the truth which is now accepted and acceptable!

In no institution will all the faculty be engaged in productive research, still less in scientific research. Some will be primarily teachers and executives, geniuses in committee work; others will "build their homes by the side of the road" and inspire young men with their great personalities, without adding anything to the sum total of human knowledge; still others will find greatest chance for service in making

books or public addresses and in great public leadership. All these types are valuable and necessary. But each of us should contribute something.

Our colleges are founded and perpetuated on the ideal of service and if a man in our faculty can not subscribe to that ideal, he ought to withdraw or be withdrawn.

If now there are some who subscribe to the lofty ideals of the college, yet feel that they can serve best by doing none of the above things, but by doing productive research, then the college should try to provide aid and encouragement for them as it would for those doing any of the other things mentioned.

There are several misconceptions in regard to research. An effort to simply find out how sauerkraut is made, I would hardly call a research, even though the information were new to me. As I understand it, the word research signifies a *diligent protracted investigation, especially for the purpose of adding to human knowledge.* No protracted investigation would be required to find out how sauerkraut is made in the Lehigh Valley and the knowledge when found would hardly be novel.

The protracted character of research makes it appear necessary to have an unusual amount of leisure, and those of us in colleges know that we have little or no leisure. Leisure may be desirable for research, but as most people would define the term, it is hardly indispensable, for some of the best research in the world has been done by busy teachers in small colleges. I note that many lament their lack of leisure in a way which assures me that they are really boasting of the fact that their time is well filled. There is no one whose time is not filled up with something. Fair health and will power are all that are necessary. Much can be done in the time between when dinner is called and when dinner is served, according to Ostwald. Then there are our nights, to say nothing of summer.

With only a high-school education, Thomas Mixesell carried on the most complete, extensive and accurate phenological observations ever made, in conjunction with his regular farm operations and with no idea that his records would prove invaluable. In addition to records of rainfall and temperature, he kept records for 150 species of plants for 30 years, recording every phase of plant growth from the time the buds started until the plant was divested of leaves and scarcely a single observation was missing. Similar records were kept of the times of migration, dates of nesting and other life incidents for a large variety of birds. Mixesell was strongly opposed in his work by his wife, who thought it a waste of time. A large portion of his work was destroyed, an irreparable loss! Mixesell's wife typifies the community at large, which is always asking "Of what use is it?" to which the proper answer is that of Benjamin Franklin, who asked, "Of what use is a newborn babe?"

There is need, then, for encouragement of research work. Library facilities, apparatus, leisure and opportunities for publication are the rewards the investigator craves. Simply because our country has the greatest wealth of any in the world, and that certain research organizations are liberally endowed is no proof that civilization will not repeat the stupid blunders of allowing Carl W. Scheele to perish of cold in his miserable little laboratory, or Mosely to be shot at Gallipoli or Lavoisier to be beheaded at Paris. "It took but a moment to cut off that head, but two centuries have not produced another like it," some one has remarked regarding Lavoisier.

What, then, is the function of research in the college? In the words of President Richards, research should be coordinate with teaching. I do not need to add that this has not been the case in the past. Was it not yesterday that the frugal old wives around us exclaimed at the waste of time involved in the investigation of bisparaaminodiorthohydroxyarsenobenzene, unmindful of the fact that this very substance under the simpler name of arsphenamine is ushering in a new day in medicine.

Somewhat like guilty boys who go behind the barn to smoke their first cigarette, those doing research still need to work very quietly to avoid suspicion of neglecting their classes or of subverting established institutions of some sort. This ought not so to be.

Dr. W. R. Whitney remarked to the speaker that the work of Sir William Ramsay on the rare gases has benefited the General Electric Company to the extent of over a million dollars and yet neither he nor University College has directly benefited from that fact. This work was carried on with no idea that it would benefit this or any other company. There are numberless researches which can not be carried out by a single industry with any expectation that the industry will be directly benefited. If the individual *industries* can not take the risk involved in their prosecution, should we expect *individuals* who are enthused with the research spirit to take all the risk? No, I think the colleges should carry on fundamental researches, collecting from the industries or the state the money necessary for the prosecution of the work, in the way of buildings, apparatus and salaries. Such research institutes have already proven a great success, notably the Carnegie Institution, the Rockefeller Institute and the Mellon Institute; and others more definitely affiliated with colleges could be named.

"He who makes two blades of grass grow where one grew before is a public benefactor." This encomium of praise to the farmer who is more indus-

trious than his fellows may be deserved. If he ruined his health and thereby became a charge on his fellows the truth would be less obvious, and we suspect that this proverb, like most proverbs, is only a half-truth. But what shall we say of the chemist Liebig who found that those two blades could be made to grow with no additional sweat of the brow, both this year and next, both on his own farm and every other farm, by merely spreading on the soil a little potash or niter or phosphate from a neighboring farm? Pasteur by his own researches saved France enough to enable her to pay off the Franco-Prussian war debt, according to Huxley. So we may assume that our colleges, which assume this research obligation to society, will eventually be amply repaid for their trouble. Conquest by war made men rich by making weaker peoples poor, but the conquests of science make us all rich, the many enjoying the luxuries of food, raiment and education formerly afforded by the few.

Lastly now as to that philosophical inquiry of Bertrand Russell, as to whether all this wealth and leisure made possible by our mastery of nature is making the race better or worse. Undoubtedly he is right in saying that the biological equilibrium of man is being disturbed, which may produce profound changes in him. Believing in evolution, this is the same as saying that the world is even now passing through one of those cataclysms which in the past caused the destruction of many species, but always caused the emergence of higher forms better suited to the new environment.

I make the plea, therefore, not for scientific research alone, but for the unshackling of knowledge as a whole. Research in language and religion, for example, has to too great an extent been devoted to the dead past instead of to the vibrant present and the pregnant future. Research along the line of eugenics is necessary if the race is to improve.

Mind has not in the past been a conscious directing force in evolution, but there can be no doubt that much can be accomplished in just this thing and the universities and colleges must lead in formulating our ideal and the method of approximating it. In the end it will appear that the aims of science and religion are one. "The Kingdom of Heaven is within you. You shall know the truth, and the truth shall make you free."

EUGENE C. BINGHAM

LAFAYETTE COLLEGE

DISMISSAL OF DR. HENRY FOX FROM THE FACULTY OF MERCER UNIVERSITY

"PITILESS publicity" is often the only remedy for educational as well as for governmental ills, and this is equally true whether these ills are recognized as such or are defended in the name of religion or patriotism. The latest instance of the wave of religious intolerance that has been sweeping through certain colleges in this country is the dismissal of Dr. Henry Fox from the faculty of Mercer University, Macon, Georgia—ostensibly not because of anything he has taught or done but because his private theological opinions are not as positive and clear-cut as those of "a majority of the Baptists of the State of Georgia."

Dr. Fox holds the degrees of B.S., M.A., and Ph.D. from the University of Pennsylvania. He has been instructor in biology in the University of Wisconsin, professor of biology in Temple University, professor of biology in Ursinus College and since 1918 professor of biology in Mercer University. From 1907 to 1912 he was field investigator for the U. S. Bureau of Entomology and he has continued to serve in that capacity during the summers since that time. He is the author of numerous research papers and is a member of several national biological societies; he was president of the Georgia Society of Biologists for 1923, and has been secretary of the Georgia Academy of Sciences since 1922. These items are mentioned to show that Dr. Fox is a scientist of recognized ability.

That he was a hard-working and inspiring teacher and an unselfish and helpful colleague is shown by the high esteem in which he was held by the students and faculty of Mercer University. On learning that he was to be dismissed the students passed resolutions (*Mercer Cluster*, Oct. 17) protesting against his removal and commending him for his high Christian character and loyalty to truth, to Mercer University, and to religion; they state that he never taught evolution as a fact but as a theory, that in matters of religion he always showed a reverent, sympathetic and constructive spirit, that "he always advised students to maintain their religious faith and ideals, stating that there is no conflict between true science and true religion; and finally that the great development of the science department at Mercer University had come through his efforts." Students preparing for the ministry who had taken Dr. Fox's work were particularly strong in their commendation of him and in their condemnation of the proposed dismissal.

President Weaver, in an article published in *The Christian Index*, the organ and property of the Baptists of Georgia, after the dismissal of Dr. Fox said of him: "Dr. Fox is a member of one of our Macon Baptist churches in good and regular standing, one of its most constant attendants, a generous contributor to the 'Seventy-five Million Campaign,' and a man whose daily life commands the admiration of all who

know him. The [theological] views which he has set forth were not known to any one on the campus or in the church of which he is a member. He held them as private opinions until he was instructed by the board of trustees and the president to state them fully in writing." And in the letter transmitting to him the resolutions of the executive committee of the board of trustees demanding his resignation, the president wrote (*Christian Index*, Oct. 16):

> In transmitting to you these resolutions, I wish to express for you my high personal regard, and to assure you that so far as I am able to form an honest judgment, you have observed every regulation, and have taught your classes in harmony with the educational policy of the institution which has been affirmed and reaffirmed by the Board of Trustees. This policy requires all professors in teaching any subject, theological or scientific, to distinguish clearly betwen the theories and the facts, and not to become avowed partisans of any theories, but to set forth fairly and thoroughly the arguments for and against the theories, leaving to the student the conclusions to be reached. . . . I regret that the judgment of these two bodies [the Administrative Committee of the Executive Committee of the Georgia Baptist Convention and the Executive Committee of the Board of Trustees of Mercer University] the one possessing the moral right and the other the legal right to control Mercer University, should not be favorable to your continuance until the termination of your contract next June. As I endeavor to interpret the reasons which have led to this judgment, I am persuaded that it does not involve the question of evolution. You have not taught the theory of evolution as an established fact. In your class-room work you have always represented its hypothetical character. This theory is one which every student in science must know, and I am glad that in your presentation of it you have never shown a dogmatic or arrogant spirit. Therefore, I am led to the conclusion that the real reason for the course taken by our two governing bodies is the statement of your beliefs made to a committee appointed by the Board of Trustees, in which it seemed to this committee that your attitude toward certain basal evangelical beliefs would prevent you in giving any instruction, from presenting the facts of science in such a way as to strengthen the faith of the students in those doctrines which evangelical Christians hold to be most essential. It is true that in your department the points of contact have not been many, and I am informed that you have always avoided in your classroom any discussion of subjects that would have bearing upon theological issues. It follows that the Trustees and the officials of the Georgia Baptist Convention hold to the conviction that to be an acceptable interpreter of any subject taught in the institution, there must be on the part of the instructor an earnest desire to promote the faith as it is held by evangelical Christians. I thank you most heartily for your faithful services as a teacher, for the splendid record your students have uniformly made in the medical schools of the nation, for your high scholarly standards, and for the irreproachable life you have lived among us. With every expression of esteem, I remain
>
> Cordially yours,
> RUFUS W. WEAVER,
> *President*

Dr. Fox was a member of the Baptist denomination before going to Georgia and was not aware that his theological beliefs differed materially from those held by intelligent Baptists generally. When he was employed by Mercer University he was not asked regarding these beliefs and he had never stated them until he was ordered to do so by the inquisitorial committee appointed by the trustees for that purpose. He was a good and faithful member of a Baptist church in Macon. His teaching was in full accord with the requirements of the trustees and was eminently satisfactory to the students and the president. Why then were the trustees so concerned about his private theological opinions at just this time? The fact is that the criticism arose because it was reported among the Baptists of Georgia that he was teaching evolution, and although the president assured the Baptist Convention that he was teaching it only as a theory and not as a fact, one of his critics expressed a general opinion when he said to Dr. Fox: "What the average Georgia Baptist desires is that after the professor has discussed the scientific evidences bearing upon a given view, he should then pick up a copy of the Bible, read there what the Bible has to say on the matter, and announce that the Bible is the final court of appeal."

The questions put to Dr. Fox by the committee of inquiry were of a purely theological character, such as his conception of God, of personal immortality, of the inspiration and authority of the scriptures, of the divinity of Christ, of the virgin birth, etc., and his written answers to these questions, which were prepared without any thought of publicity, are an admirable presentation of the religious views of a reverent but liberal Christian scholar. This statement was afterward published by the committee in the *Christian Index*, Oct. 16, p. 27, as a justification of the summary action of the trustees, and it deserves wide publicity as an example of rational religious faith, but of course it only served to inflame the more those fundamentalists who renounce reason and common sense in religion and who demand the expulsion of all who do not accept their own narrow and literal interpretation of the scriptures or creeds.

And so, at the beginning of the academic year for which he had been reappointed only last spring, Dr. Fox was paid his salary for the year and dismissed from his professorship, since he declined to resign, and a high school teacher in Macon whose religious

beliefs are satisfactory to the Baptists of Georgia was appointed in his place, and in order to avoid any liberal contamination in the future, plans are being devised to require every member of the faculty or candidate for appointment to sign a religious covenant or creed that will be satisfactory to the Baptists of Georgia. Thus are religion and scholarship and science promoted at Mercer University.

E. G. CONKLIN

PRINCETON, N. J.

SCIENTIFIC EVENTS

CELEBRATION OF THE FIFTIETH ANNIVERSARY OF STEREOCHEMISTRY IN FRANCE

ON December 22 the Société Chimique de France celebrated the fiftieth anniversary of the founding of the science of stereochemistry. It was in 1874 that two scientists, the one French, Le Bel, and the other Dutch, van't Hoff, both former students of Wurtz, professor of the Faculty of Medicine of Paris, published independently and within a few weeks of each other, the general theory of the asymmetric carbon atom which explained in a rational manner molecular asymmetry discovered by Pasteur twenty-five years previously.

M. François Albert, Minister of Public Instruction, presided at the ceremony, assisted by M. Painlevé, member of the institute and president of the Chamber of Deputies, Jonkheer J. Loudon, Minister Plenipotentiary of Holland, and a number of representatives of French and foreign scientific societies.

Argentina—A. Saubidet, chancellor of the Argentine Consulate and president of the International Office of Analytical Chemistry.
Belgium—Professor Wuyts.
Esthonia—M. Schmidt, Chargé d'Affaires of the Legation of Esthonia.
Great Britain—Sir William Pope, Cambridge University.
Greece—Dr. Valtis, representing the Ministry of Greece.
Holland—Jonkheer J. Loudon, Minister Plenipotentiary; Professor Cohen, Institute van't Hoff; Dr. Alingh Prins.
Norway—M. Brettenville.
Serbia, Croatia, Slavonia—His Excellency, M. Tomitch.
Switzerland—Professor Paul Dutoit, delegate of the council of the Chemical Society of Switzerland.
United States—Professor Paul M. Dean, University of Colorado.

After a discourse by M. Moureu, president of the Société Chimique de France, M. Haller, in the name of the Academy of Sciences, presented to M. Le Bel the "grande médaille d'or de Lavoisier." Following the response by M. Le Bel, who still maintains an active interest in chemistry, brief addresses were made by Sir William Pope and Professor Cohen. The meeting was closed by a lecture on the "Progress of stereochemistry" by Professor Delepine.

PAUL M. DEAN

PROJECT FOR THE SCIENTIFIC IMPROVEMENT OF AGRICULTURE IN CHINA

AN international project for the scientific improvement of the important food crops of China has been inaugurated by the University of Nanking and Cornell University with the aid of the International Education Board. Dr. H. H. Love, of the department of plant breeding in the New York State College of Agriculture, at Cornell, will leave Ithaca in March for China, to devote his sabbatic leave of six months to organizing the work. In February of 1926 Dr. C. H. Myers, of the same department, will go to China and carry on the work for six months. In this way the several members of the department will take turns in devoting their regular sabbatic leaves of absence from Cornell to this work in China until a staff has been trained at Nanking to carry it on. The cooperative plan is expected to be continued for the next five to ten years.

This program is a part of a large scheme for the prevention of famines in China, in which the University of Nanking is doing important work, and it looks to a permanent improvement and increase of the food supply. Improved strains of the various food crops must be developed so that the Chinese farmer can obtain an increased yield at a very slight increase in cost. Dean J. H. Reisner, of the College of Agriculture and Forestry at Nanking, has sought American aid in establishing the plant breeding part of the scheme.

As much plant improvement work as the facilities and time will permit will be carried on from the beginning. The experiment staff will make a general study of the more important food crops in several provinces so as to determine which varieties of each crop will serve as foundation stocks for improvement work. At the same time they will train a group of Chinese to carry on this work after the cooperation shall have ceased.

The University of Nanking will provide the facilities, Cornell will cooperate by enabling its specialists in plant breeding to lend their services, and the International Education Board will furnish certain financial aid.

THE BELL TELEPHONE LABORATORIES

THE growth of the research and development work of the Bell System has led to the formation of Bell

Telephone Laboratories, Incorporated, organized on January 1, 1925, for the purpose of carrying on development and research activities in communication and allied fields.

This new company, which is jointly owned by the American Telephone and Telegraph Company and the Western Electric Company, Incorporated, has taken over the personnel, buildings and equipment of the research laboratories of these two companies which were formerly operated as the Engineering Department of the Western Electric Company.

Extensions of laboratory facilities for the scientists and engineers of the new corporation are already under way. Laboratory space in the form of a new building covering almost a quarter of a city block will be added to the 400,000 square feet at present in service in the group of buildings at 463 West Street, New York City. At the date of incorporation, the personnel numbered approximately 3,600, of whom about 2,000 are members of the technical staff, made up of engineers, physicists, chemists, metallurgists and experts in various fields of technical endeavor.

The chairman of the board of directors of the Bell Telephone Laboratories is General J. J. Carty, vice-president of the American Telephone and Telegraph Company. Other members of the board are: Dr. F. B. Jewett, formerly vice-president of the Western Electric Company, who is president of the new corporation, and also recently elected vice-president of the American Telephone and Telegraph Company; W. S. Gifford, executive vice-president of the American Telephone and Telegraph Company; C. G. DuBois, president, and J. L. Kilpatrick, vice-president, of the Western Electric Company, and J. B. Odell, assistant to the president of the Western Electric Company.

The operations of the Bell Telephone Laboratories are under the direction of E. B. Craft, executive vice-president, who was formerly chief engineer of the Western Electric Company.

In the functional division of the research, development and engineering work of the laboratories, physical and chemical research is organized under Dr. H. D. Arnold, director of research; development of apparatus under J. J. Lyng, apparatus development engineer, and development of communication systems under A. F. Dixon, systems development engineer, all formerly concerned with similar activities in the engineering department of the Western Electric Company. Dr. R. L. Jones, inspection manager, continues his former responsibilities in engineering inspection, and S. P. Grace, commercial development engineer, those of commercial development.

The formation of Bell Telephone Laboratories, Incorporated, provides an individual organization, the whole activities of which may be more efficiently devoted to the furtherance of research, development and engineering investigations along the line in which the parent companies have already made great progress. Its formation is an indication of the estimate which these companies place upon the importance of properly organized research.

TRANSFER OF THE COLLECTION OF TYPE CULTURES OF BACTERIA

THE collection of type cultures of bacteria established at the American Museum of Natural History by Dr. C.-E. A. Winslow and more recently maintained at the Army Medical Museum by the Society of American Bacteriologists, will be transferred about the first of February to the McCormick Memorial Institute of Chicago.

This has been made possible by a grant secured by the National Research Council from the General Education Board, which provides for the maintenance of the collection for a period of five years.

The general supervision of the culture collection will be vested in a committee representing the Society of American Bacteriologists, the Society of Pathologists and Bacteriologists, the American Phytopathological Society, the American Society of Zoologists and the McCormick Memorial Institute.

The maintenance and distribution of the cultures will be under the direction of Dr. L. Hektoen, director of the McCormick Institute, assisted by Dr. Geo. H. Weaver and Dr. Lula Jackson.

The committee hopes to greatly enlarge the collection, and eventually to include fungi, molds and other microorganisms, as well as a comprehensive collection of bacteria.

Under the new arrangement a charge will be made for cultures which, while it will not be sufficient to cover the cost of the culture, will help in the maintenance of the collection. A catalog will be issued as soon as possible.

L. A. ROGERS

MINUTE ON THE LIFE OF PROFESSOR GEORGE CHANDLER WHIPPLE

THE following minute on the life and services of Professor Whipple was prepared by a committee from the Faculty of Arts and Sciences, the Faculty of the Engineering School and the Faculty of the School of Public Health, Harvard University:

George Chandler Whipple, Gordon McKay professor of sanitary engineering, died at his home in Cambridge on the morning of November 27, 1924, in the fifty-ninth year of his age.

Coming to the University thirteen years ago from an

uncommonly successful and versatile professional practice, he devoted himself with simplicity, faith and enthusiasm to his new tasks, illuminating them by his experience, and carrying to his continuing general practice the inspiration of his university attachment.

As his interest in public affairs ranged from the minutiæ of local administration to projects for world sanitation under the League of Nations, so in the university his services were unique in their breadth: to undergraduates he taught municipal engineering; to engineers, the principles of sanitary science; and to graduate physicians, the environmental factors in the safeguarding of the public health. He had the faculty of adapting both the spoken and the written word to the audience he sought to reach; with equal effectiveness he wrote for the popular magazine, for the technical periodical and assembled his learning in standard treatises.

A leader among the pioneers who, by applying the discoveries of Pasteur, reconstructed sanitary science upon a biological basis, he was withal a modest man, youthful in his enthusiasm, simple in his habits of life, open, approachable and affectionate. By his students, colleagues and professional associates, he will always be held in friendly remembrance.

HECTOR J. HUGHES,
WILLIAM B. MUNRO,
EDWIN B. WILSON,
Committee.

SCIENTIFIC NOTES AND NEWS

THE second annual prize of the American Association for the Advancement of Science has for this year been divided and awarded as two prizes of five hundred dollars each, to Dr. L. R. Cleveland, of the Johns Hopkins School of Hygiene and Public Health, for his work on the physiology of termites and their parasites, and to Dr. Edwin P. Hubble, of the Mount Wilson Solar Observatory, for his work on the nebulae.

DR. MICHAEL I. PUPIN, professor of electromechanics at Columbia University and president of the American Association for the Advancement of Science, has been nominated for president of the American Institute of Electrical Engineers.

DR. JAMES F. KEMP, professor of geology at Columbia University, at the December session of the council of the Geological Society of Belgium, was elected a foreign correspondent.

THE gold medal of the Royal Astronomical Society has been awarded to Sir Frank Dyson, astronomer royal, for his general contributions to astronomy, and in particular for his researches on the proper motions of stars. The medal will probably be presented at the regular meeting of the society on June 12.

THE Institution of Electrical Engineers, London, has made the fourth award of the Faraday medal to Sir Joseph J. Thomson, an honorary member of the institution, and Master of Trinity College, Cambridge.

THE Institution of Gas Engineers, England, has nominated Dr. Charles Carpenter, president of the South Metropolitan Gas Company, for the award of its Birmingham gold medal, awarded for services rendered in the science and practice of gas engineering.

THE Royal Society at London has conferred its gold medal on Dr. Albin Haller, professor of chemistry at Nancy, according to the *Journal* of the American Medical Association.

THE T. Kocher prize at the University of Bern has been given to Professor Baltzer to enable him to continue research on heredity and predetermination of sex.

PROFESSOR WARREN D. SMITH, head of the department of geology in the University of Oregon, was recently elected president of the Cordilleran section of the Geological Society of America.

DR. MAXIMILIAN TOCH has been appointed chairman of the patent committee of the American Institute of Chemical Engineers.

ROBERT RIDGWAY, of New York, has been elected president of the American Society of Civil Engineers.

DR. WALTER L. BIERRING, Des Moines, Iowa, has been elected by the directorate of the Alpha Omega Alpha, honorary medical fraternity, to the presidency of this organization for a term of six years. Dr. Bierring succeeds Dr. John L. Heffron, of Syracuse, New York, who was killed in an automobile accident last September.

DR. SOLON I. BAILEY, Phillips professor of astronomy at the Harvard Observatory since 1912, and for thirty-seven years a member of the Harvard faculty, has retired.

PROFESSOR JOSEPH P. NAYLOR, head of the department of physics at De Pauw University, will retire from active service next June. He will continue to do research work in the university laboratory.

SIR HAROLD STILES has resigned the chair of clinical surgery at the University of Edinburgh.

DR. J. E. LILIENFELD, professor of physics at the University of Leipzig, on an extended leave of absence, has affiliated himself with the American Bosch Magneto Corporation as chief physicist in charge of radio research and development work—a new division of the corporation.

PROFESSOR CARL C. FORSAITH, of the New York State College of Forestry at Syracuse University, has accepted an offer from the English government through the Imperial Forestry Institute at the Uni-

versity of Oxford to organize a department of wood technology at the university.

DR. SEBASTIAN LOMANITZ, formerly chemist of government and state experiment stations in Mexico, and more recently engaged in graduate research work at Rutgers College, has been appointed chemist to the Tropical Plant Research Foundation for service on sugar cane problems in Cuba.

DR. WILLIAM HALE CHARCH and Dr. John Dorman McBurney have accepted positions in research departments of the E. I. duPont de Nemours and Company.

M. L. HAMLIN, formerly research fellow and assistant professor of chemistry, Duke University, Durham, N. C., has joined the technical staff of the Beech Nut Packing Company, Canajoharie, N. Y., as research chemist.

DR. ALBERT ERNEST JENKS, professor of anthropology, on sabbatic leave from the University of Minnesota, sailed on January 28 to spend the remainder of the year in study and research in Europe. The first half of the year was spent in Washington. Dr. Jenks returns the last of June to join the faculty of the University of California for its Southern Branch summer session in Los Angeles.

PROFESSOR HERBERT OSBORN, of the University of Ohio, will spend February and March in Cuba, for the Tropical Plant Research Foundation, to study leaf hoppers occurring on sugar cane and other plants there.

PROFESSOR SHUNSUKE KUSANO, professor of botany, Imperial University of Tokyo, recently visited the Missouri Botanical Garden.

CAPTAIN ROALD AMUNDSEN, the Arctic explorer, who is going to attempt to fly across the North Pole this summer, sailed for Europe on February 4. It is reported that the money for the expedition has been subscribed.

DR. WILLIAM F. DURAND, president of the American Society of Mechanical Engineers, left New York City, February 7, on a trip which will take him to the Pacific Coast and back by March 10. He will visit local sections and student branches of the society in St. Louis, Kansas City and Columbia, Missouri; Lawrence, Kansas; Lincoln and Omaha, Nebraska; Denver, Fort Collins and Boulder, Colorado; Salt Lake City, Reno, San Francisco, Houston, New Orleans, Baton Rouge, Memphis and Louisville.

PROFESSOR FLOYD K. RICHTMYER, of the department of physics at Cornell University and national president of Sigma Xi, left Ithaca on January 25 for a journey to the Pacific Coast, where he will take part in the installation of a new chapter at the California Institute of Technology, Pasadena. On his way Dr. Richtmyer will address meetings of local chapters at a number of western universities.

DR. WILLIAM G. MACCALLUM, professor of pathology in the Johns Hopkins University, gave two lectures at the Medical School of the University of Buffalo, January 22 and 23, on the result of recent research as to the causes and treatment of acute rheumatism.

PROFESSOR F. R. MOULTON, of the University of Chicago, has given recent lectures as follows: December 10, at Western Reserve University, the McBride lectures on recent astronomical developments; December 16, at the University of Illinois, before the Mathematics Club a lecture on continuity, and at the founders' day banquet a lecture on recent progress in cosmogony; on January 14, at the University of Indiana, at the convocation a lecture on other worlds than ours, and before the Sigma Xi a lecture on recent cosmogonies.

DR. JEROME ALEXANDER has given the following addresses in Canada: January 23, at University of Toronto, before the local section of the Society of Chemical Industry, on "Packing house products." January 26, at Victoria Museum, Ottawa, before the local section of the Society of Chemical Industry, on "Milk and milk products." January 27, at Queens University, Kingston, on "Applications of colloid chemistry in medicine and technology." January 28, at McGill University, Montreal, on "Colloid chemistry."

DR. HERBERT E. IVES, of the Bell Telephone Laboratories, Inc., New York, lectured on "The transmission of pictures by telephone," before the Purdue University Chapter of Sigma Xi, on January 28, and before the Detroit Engineering Society and the local section of the Institute of Electrical Engineers on January 30.

DR. KURT KOFFKA, of the University of Giessen, will give a series of twelve lectures on the Jacob H. Schiff foundation at Cornell University twice a week beginning February 16. Dr. Koffka's subject will be the psychology of *gestalt* and its relation to other sciences.

DR. WILDER D. BANCROFT, of Cornell University, gave a lecture at the Franklin Institute, Philadelphia, on "Metallic luster," on January 29.

ON January 17, Professor Chandrashekara V. Raman, F.R.S., of the University of Calcutta, delivered an address to the Royal Canadian Institute, Toronto, on the subject "Some Indian contributions to science." On January 24, Professor Dayton C. Miller,

of the Case School of Applied Science, Cleveland, delivered an address to the institute on the subject "Ether-drift and the theory of relativity."

DR. W. F. FARAGHER, of the Mellon Institute, Pittsburgh, delivered two lectures on distillation before the students in chemical engineering at Columbia University, January 12 and 13.

ON January 20, Dr. Ellwood Hendrick lectured before the Swarthmore chapter of Sigma Xi on "The sense of smell."

DR. ARTHUR GRAHAM HALL, formerly professor of mathematics at the University of Michigan, died on January 10, aged fifty-nine years.

PROFESSOR EPHRAIM MILLER, emeritus professor of mathematics at the University of Kansas, died recently at the age of ninety-one years.

DR. E. S. JOHONNOTT, for many years professor of physics at Rose Polytechnic Institute, Terre Haute, Indiana, was instantly killed on January 2, when his automobile was crushed by an interurban car.

DR. WILLET G. MILLER, provincial geologist of Ontario and president of the section of geology of the British Association for the Advancement of Science, died on February 5, aged fifty-eight years.

M. L. HOLMAN, retired mechanical engineer and past president of the American Society of Mechanical Engineers, died on January 4, aged sixty-four years.

NATHANIEL S. KEITH, electrometallurgical engineer and one of the founders of the American Institute of Mining and Metallurgical Engineers, died on January 27, aged eighty-six years.

SIR JAMES MACKENZIE, distinguished English physician and heart specialist, died on January 26, aged seventy-one years.

SIR GUILFORD MOLESWORTH, eminent British engineer, died on February 2 at the age of ninety-six years.

WILLIAM WHITAKER, F.R.S., the distinguished English geologist, died on January 15, aged eighty-eight years.

DR. JULIUS MORGENROTH, professor at the Robert Koch Institute for the study of infectious diseases in Berlin, known for his work on immunity, died on December 20 at the age of fifty-three years.

THE death is announced of Dr. Loring W. Bailey on January 10 at the age of eighty-five years. A correspondent writes: Dr. Bailey had an extraordinary career in educational science. For 64 years his name was enrolled on the faculty list of the University of New Brunswick, a record which probably has not been surpassed. For 49 years of this time he was in active service as professor in charge of the department of natural science. For a long period Dr. Bailey was provincial geologist of New Brunswick and also maintained a connection with the Geological Survey of Canada. His writings on the geology of his province are numerous and important.

AT the recent meeting of the American Society of Zoologists, the following officers were elected for the ensuing year: *President,* C. R. Stockard, Cornell University Medical College; *vice-president,* C. R. Moore, University of Chicago; *secretary,* D. E. Minnich, University of Minnesota; *treasurer,* L. B. Arey, Northwestern University Medical School.

THE Philadelphia Pathological Society has elected the following officers for 1925: *President,* E. B. Krumbhaar; *vice-president,* E. L. Opie; *secretary-treasurer,* B. Lucké; *recording secretary,* M. McCutcheon; *curator,* F. W. Konzelman.

AT the last meeting of the Philippine Scientific Society the following officers were elected: *President,* Dr. Leopoldo A. Faustino; *vice-president,* Dr. Amando Clemente; *secretary-treasurer,* Dr. Vicente G. Lava; *councilors,* Mr. Antonio D. Alvir, Dr. Nicanor G. Teodoro and Dr. Constancio Pacifico Rustia. The annual meeting will be held in July in Manila at which scientific papers dealing particularly with Philippine problems will be presented.

THE alumni chapter of Sigma Xi of the University of Pittsburgh held a meeting on January 19. The following program was given by the department of mathematics: "Depreciation," by Dr. J. S. Taylor; "Some special types of collineation groups," by H. M. Culver; "Magic squares and circles," by A. G. Montgomery; "Non-euclidean and higher dimensional geometries," by Dr. K. D. Swartzel; "Scientific research and the statistical method," by F. A. Foraker. The Mellon Institute will present a program on Monday, February 16.

THE twentieth annual meeting of the American Association of Museums will be held in St. Louis, Missouri, from May 17 to 21. The Association of Art Museum Directors is planning to meet a few days earlier.

THE Baltimore Safety Conference was held on Friday, January 23, at the Emerson Hotel, Baltimore, Maryland. The meeting was under the auspices of the American Council of Safety Engineers, the engineering section of the National Safety Council and the Baltimore Safety Council. Special attention was given methods of practical accident prevention; aspects of plant design affecting safety, such as illumination, layout and electric appliances; and in-

dustrial safety from the standpoint of the surgeon, foreman and workman.

THE Pennsylvania chapter of the Wild Flower Preservation Society through its president, Professor John W. Harshberger, has secured sixty-seven county chairmen, one for each of the sixty-seven counties in the state. These chairmen will furnish information on the subject of wildflower preservation to their local communities.

THE fifth year of the American School of Prehistoric Research in Europe, in charge of Dr. George Grant MacCurdy, of Yale University, will open in London on June 25. The itinerary of museums, excursions and excavations will include London and southern England; Brittany and Paris; Toulouse and the Pyrenees from Foix and Niaux by way of Tuc, Trois-Frères, Montespan, Lespugue and Lourdes to Isturitz; Madrid, Altamira, Castillo and La Pasiega; Périgueux, Les Eyzies and the caves of the Dordogne, including a month (August) of digging in the leased site of Castel-Merle at Sergeac; Neuchâtel, Berne, Interlaken and Zurich; Tübingen, Heidelberg and Bonn; Liège and Brussels. The summer term will end September 25.

AT the annual meeting of the Board of Surveys and Maps of the Federal Government, held on January 13, Dr. William Bowie, chief of the division of geodesy of the U. S. Coast and Geodetic Survey, was reelected chairman of the board; Mr. A. D. Kidder, cadastral engineer of the General Land Office, was reelected vice-chairman, and Major J. H. Wheat, officer in charge of the map information office of the Board of Surveys and Maps, was elected secretary. The Board of Surveys and Maps was created by executive order of December 30, 1919, with a view to furnishing means of coordinating and correlating the work of the mapping and surveying organizations of the government and of making it possible to avoid duplication of effort. At its creation, 14 organizations had representation on the board, four other organizations being added later by executive order.

A GIFT from Martin A. Ryerson, trustee of the University of Chicago, has been made for continuing the experiments of Professor A. A. Michelson, head of the department of physics in the university, in making measurements of the velocity of light.

THE Boston Society of Natural History has received from the executors of the estate of William Brewster an amount approximating $51,000, the income of which is to be used for the purchase of birds and the publication of papers relating to ornithology.

BY the will of the late Mrs. Kate S. Richardson, of New Haven, the Peabody Museum at Salem will receive $100,000.

UNIVERSITY AND EDUCATIONAL NOTES

GROUND was broken on January 31 for the $10,000,000 Columbia-Presbyterian medical center, which is to be built on the twenty-two-acre site at Broadway and 168th Street, New York. The program included addresses by Nicholas Murray Butler, president of Columbia University, and Dr. C. Floyd Haviland, chairman of the New York State Hospital Commission.

ON January 24 the cornerstone of the new Marion Law Memorial Hall of Geology and Biology at Cornell College, Iowa, was laid with fitting ceremonies. In addition to the Law Memorial Building, a large wing is being built to house the department of physics.

THE University of Colorado School of Medicine formally dedicated the new medical school and hospital buildings on the campus in Denver on January 23.

DEAN ROSCOE POUND, of the Harvard School of Law, has declined the offer of the University of Wisconsin to become president of that institution.

DR. IRVING SAMUEL CUTTER, for nearly ten years dean of the College of Medicine at the University of Nebraska, has been appointed dean of the Medical School of Northwestern University. Dean Cutter succeeds Dr. Arthur I. Kendall, who resigned last year to take up research and laboratory work with Washington University.

PROFESSOR WOLFGANG KOEHLER, head of the department of psychology in the University of Berlin, will be at Clark University as visiting professor of psychology from February 1, 1925, until February 1, 1926.

DR. JOHN H. BRADLEY, JR., has been appointed assistant professor of geology at the University of Montana.

AS lecturer on sanitary engineering, the chief chemist of the State Department of Health, Harry W. Clark, will continue the late Professor Whipple's courses in the engineering school at Harvard University.

C. T. R. WILSON, reader in electrical meteorology at the University of Cambridge and observer in meteorological physics at the Solar Physics Observatory, has been elected to the Jacksonian professorship of natural philosophy in the university.

PROFESSOR ANDREAS VON ANTROPOFF, of the Technische Hochschule, Karlsruhe, has been offered the chair of physical chemistry at the Chemical Institute in the University of Bonn.

DISCUSSION AND CORRESPONDENCE

THE SEX-CHROMOSOMES OF SEA-URCHINS

AT page 758 of the recently published new (third) edition of my book "The Cell in Development and Heredity" will be found a confusing inconsistency that somehow escaped attention until too late for correction in the proof-sheets. Its source lies in the following passage relating to the observations of Tennent, Baltzer and others on the sex-chromosomes of sea-urchins:

> The critical evidence was obtained from forms in which the sex-chromosome is characterized by its atelomitic or non-terminal attachment, and has accordingly the shape of a V or U (*Parechinus microtuberculatus*) or of a J (*Paracentrotus, Toxopneustes, Hipponoë, Moira*). All the observers named, beginning with Baltzer, have found the segmenting eggs to be of two kinds, some containing one such sex-chromosome and others two, in addition to certain atelomitic chromosomes common to both.

Two errors occur in this passage. One is the inadvertent inclusion of *Toxopneustes* (which has a V-shaped "sex-chromosome") with those in which it is J-shaped or hook-shaped (*Hipponoë,* etc.). The other and more serious one is the statement that some eggs "contain one such sex-chromosome and others two." The word "two" here should be "none"—a slip which I can only explain as the result of a *lapsus calami,* and which causes the passage to be quite inconsistent with the correct statement of the facts given a few lines below.

The confusion is increased by the unlucky designation, in the succeeding paragraph, of the "sex-chromosome" or "heterochromosome" in these animals as an "X-chromosome." In point of fact, the nature of this chromosome has never been finally demonstrated. Miss Pinney labeled it as "x" in *Moira,* and elsewhere referred to it as an "odd chromosome"; but both Tennent and Baltzer proved that in fertilization it is derived from the sperm; that it is present in only half the fertilized eggs and that it is never doubled. The natural interpretation of these facts, evidently, is that the chromosome in question is a Y-chromosome, the synaptic mate of which is a rod-shaped X-chromosome that is single in the male and paired in the female. This harmonizes with Baltzer's (1913) comparison of the condition in sea-urchins to that of the *Lygaeus*-type in insects; but its correctness should be tested by study of the spermatogenesis.

EDMUND B. WILSON
COLUMBIA UNIVERSITY

OLDER PUBLICATIONS ON COLLOIDS

I TAKE this means of calling to the attention of all scientists interested, a book entitled "On the Influence of Colloids upon Crystalline Form and Cohesion, with Observations on the Structure and Mode of Formation of Urinary and other Calculi," by William Miller Ord, M.D. (Lond.), Fellow of the Royal College of Physicians in London, of the Linnaean Society, of the Royal Microscopical Society, etc. It was published by Edward Stanford, of London, in 1879, and sums up work that had been done by the author over the preceding 12 years. It also refers to splendid work done by Mr. George Rainy, lecturer and demonstrator at St. Thomas's Hospital as far back as 1857, most of which is buried in oubliette journals. These men and others working with them were far in advance of their time. They saw and recorded important truths at a time when the prevailing professorial practice was to relegate to the sink or the waste can anything that would not crystallize. *Bone formation* is one of the points discussed.

Attention should also be directed to a doctor's thesis of the University of London, "On the internal pressure of liquids," by H. Kneebone Tompkins, D.Sc., which Professor F. G. Donnan resurrected and published for the first time in the report of a general discussion on colloids (Faraday Soc. and Phys. Soc. of London, 1920). On pages 185 to 188 the analogies between vulcanized caoutchouc and *metals* is treated at some length.

JEROME ALEXANDER
NEW YORK, N. Y.

HONOR TO WHOM HONOR—

IN the issue of SCIENCE for September 5, 1924, pp. 208–9, I note the following:

> Former President Charles W. Eliot, with his inimitable style, wrote for this tablet [on one of the buildings of the Harvard Medical School] a few words which embody so perfectly the spirit of research that they should be on the wall of every educational institution. The inscription reads: "Life is short and the art long, the occasion instant, experiment perilous, decision difficult."

A little further on comes this sentence: "Here we might well repeat Dr. Eliot's words, 'The occasion instant, experiment perilous.'"

Now I am not moved by envy of Dr. Eliot's "inimitable style" for which I have all due respect, and I heartily concur in the general estimate of the value of the sentiment, but of course the inscription is nothing more than an English version of a portion of the first of the *Aphorisms* of Hippocrates, the founder of scientific medicine. It is also, I confess, a bit disconcerting to think that at the most magnificent medical establishment in the world, anybody at all, even a janitor, if it so be, could, in answer to a visitor's inquiry, ascribe the most famous saying of the most

famous physician of all time, a veritable commonplace, to a local celebrity.

W. A. OLDFATHER

URBANA, ILLINOIS
NOV. 27, 1924

ANOTHER ADULT "HOWLER"

THAT ancient legend about the figures in Haeckel's "Anthropogeny" seems still to be extruding pseudopodia. Thus in the *Baptist Beacon* (April, 1924, p. 14), from a page-long letter of Professor George McCready Price, one learns that "the fraudulent photographs of imaginary embryos which were published by Ernest Haeckel . . . are still going the rounds of books published in the interest of the evolution propaganda."

Remarkable man, this Haeckel! Not only did he *photograph imaginary* embryos—he did it twenty years before any one else had photographed *real* ones!

E. T. BREWSTER

LABORATORY APPARATUS AND METHODS

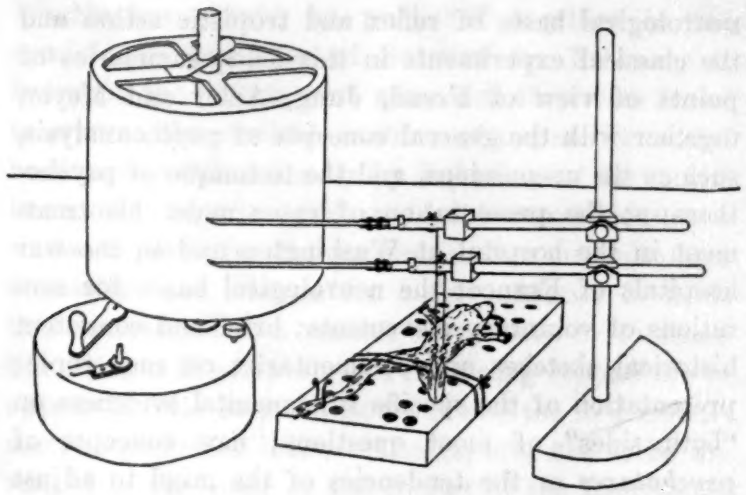
RECIPROCAL INNERVATION IN THE FROG AS A LABORATORY EXPERIMENT

AFTER examining a number of laboratory textbooks in physiology, we noticed that there was no mention made of any experiment which would illustrate the phenomenon of reciprocal reaction of antagonistic muscles. Perhaps this is due to the fact that the authors considered this experiment too difficult for elementary students of physiology, or, perhaps, that suitable apparatus was not on hand for that purpose. The only place where we did find mention made of this experiment was in Porter's textbook.

In our laboratory this has been a routine experiment for several years, and since the students have obtained such good results, with ordinary laboratory apparatus, it has been suggested to us that this fact be called to the attention of other teachers of physiology.

The apparatus we use consists of two muscle levers (Harvard Apparatus type). To the pulleys of these levers are attached the tendons of the gastrochemius and the tibialis anticus by means of pieces of thread. The after-loading screw of the lever to which the tibialis anticus is attached is raised in order to permit the lever to descend when this muscle relaxes. The frog is fastened on the frog board which is placed under these levers. The diagram shows the exact setup of the apparatus.

We are consistently obtaining many good tracings of the antagonistic action of these two muscles, showing that the experiment may be successfully and easily performed with the type of apparatus found in many physiological laboratories.



Good results may be obtained by applying a small amount of dilute acetic acid on the perineum of the frog, by stimulating in the same region with a weak tetanizing current, or with single induction shocks. We have also obtained good results by pinching the toe of the opposite foot, and by stimulating the gastrocnemius directly with single induction shocks and with the tetanizing current.

This experiment is of such fundamental importance that it occurred to us that other teachers of physiology might be interested in introducing it to the students as a standard laboratory experiment. We believe that the student can gain much by actually observing this important fact for himself.

JOHN BETHUNE STEIN
JOSEPH TULGAN

LABORATORY OF PHYSIOLOGY
NEW YORK COLLEGE OF DENTISTRY

SCIENTIFIC BOOKS

Dynamic Psychology, An Introduction to Modern Psychological Theory and Practice. By DOM THOMAS VERNER MOORE, Ph.D., M.D. Monk of the Order of St. Benedict, professor of psychology, Catholic University of America, director of the Clinic for Mental and Nervous Diseases, Providence Hospital, Washington, D. C. Lippincott, Philadelphia, Chicago and London, 1924, pp. viii + 444.

APPROACHING the field from the points of view of physician, philosopher and psychologist working in both classroom and clinic, the author defines psychology as "the science of the human personality." His attitude on questions is a resultant of his historical knowledge of philosophy and psychology, his metaphysical dualism and practical knowledge of physiology, applied psychology and psychoanalytic method.

Among the strong points of the book may be listed the following: the treatment of the physiological and

neurological bases of reflex and tropistic action and the classical experiments in this field; summaries of points of view of Freud, Jung, Adler and Meyer, together with the general concepts of psychoanalysis, such as the unconscious, and the technique of psychotherapy; the presentation of cases under his treatment in the hospital at Washington and in the war hospitals of France; the neurological bases for sensations of voluntary movements; brief and consistent historical sketches and commentaries on each topic; presentation of the specific fundamental evidences on "both sides" of moot questions; new concepts of *psychotaxes* or the tendencies of the mind to adjust itself to pleasant and unpleasant situations of a mild sort, and *parataxes*, or borderline cases of abnormal emotional adjustments exaggerated beyond psychotaxes but not yet become psychoneuroses; emphasis on the synthetic counterpart necessary to analysis in mental troubles; the idea of a plan of life as a means of seeing your own way out of mental troubles and for rebuilding abnormal lives; a glossary of technical terms and the up-to-date references to periodical literature.

The author differs from many text-book writers on certain points such as the driving forces of human nature, which he considers to be impulses or abilities, many in number. Affective mental states are independent forms of mental life, not merely attributes of sensations, but arising from them and from intellectual insight. The Lange-James theory is reversed, to state that intellectual insight into a situation is the cause of an emotion, which in turn produces complex bodily resonance, in part specific and in part common to all emotions. His chapters on the freedom of the will and the soul arise from the discussion of voluntary action.

Adversely, it may be said that the book is not usable as a basic text for elementary courses because of the almost total neglect of the cognitive processes; such as, sensation, perception, imagery, imagination and learning, memory and thought processes and most of the special senses and capacities. It does not cover the field of general psychology. Whereas the treatments are dualistic or vitalistic in most cases, the titles are behavioristic and misleading to this extent. The classification of mental capacities is unserviceable.

As a whole the book forms a very readable presentation of the special fields of reflexes, kinesthesis, volitional and abnormal psychology and psychotherapy. The well-written historical and critical sketches which introduce each topic recommend it for use as a special reference in these fields as well as an introduction for the general reader.

ROBERT HOLMES SEASHORE
STATE UNIVERSITY OF IOWA

Catalogue of the Mycological Library of Howard A. Kelly. Compiled by LOUIS C. C. KRIEGER. Baltimore, privately printed, 1924.

THIS sumptuous volume of 260 large octavo pages is a valuable contribution to the bibliography of American botany. The preface comprising five pages gives the acknowledgment of Dr. Kelly to the botanists and mycologists, past and present, who encouraged or gave aid to his mycological studies begun while he was a resident of Philadelphia. The contents of this finely bound book are arranged alphabetically. Then follows a description of exsiccati, periodicals, floras and miscellanea. The student of fungi and the working mycologist can hardly afford not to have this catalogue in their libraries. It will be indispensable to the botanical libraries of our colleges and universities. The compiler, Mr. Krieger, is an artist and mycologist of note, trained artistically at the Royal Academy of Fine Arts in Munich.

PHILADELPHIA, PA. JOHN W. HARSHBERGER

SPECIAL ARTICLES

COCONUT BUD ROT EXPERIMENTS IN PORTO RICO

COCONUT bud rot has appeared in epidemic form on the western coast of Porto Rico, more than eight hundred cases having been recorded between Mayaguez and Rincon. The earliest observable symptom of the disease is the death of the youngest folded leaf, followed quickly by the death of other young vertical leaves which collapse and fall away, leaving the palm conspicuous by the absence of a central column of young leaves. The older leaves retain their normal color and position for several months, falling away one by one until the trunk is left naked. When a diseased bud is examined a brown decayed spot is usually found near the base of a young petiole. As underlying petioles are examined the decayed area is observed to increase in size and softness. The generative tissue is completely involved in a soft, watery, malodorous rot. There is no recovery.

A fungus was isolated from diseased buds and described as a small chlamydospored strain of *Phytophthora faberi* Maublanc. It grows well on culture media, produces abundant conidia and chlamydospores, and probably does not produce oospores. The conidia and chlamydospores germinate ordinarily by pushing forth several germ tubes, and germination by zoospore formation has not been observed. The conidia are 52.67 by 30.95 microns when measured from 8- to 10-day-old corn meal cultures. The average ratio of length to diameter is 1.69. The chlamydospores have an average diameter of 34.88 microns when grown on potato dextrose agar and corn meal. This figure is considerably smaller than the ones given

for P. faberi by Delacroix and Maublanc,[1] Rosenbaum[2] and Reinking.[3] The fungus is pathogenic to wounded tomatoes, potatoes and green coconuts, but not to cacao pods, in this respect differing from Reinking's strain and corresponding to a Phytophthora isolated from coconuts in Jamaica by Ashby.[4]

Inoculations have demonstrated that this strain of *P. faberi* may cause the death of wounded or unwounded mature palms with the appearance of typical bud rot symptoms. Results obtained from wounding are not considered reliable, since wounded uninoculated palms exhibited pathogenic symptoms and in some instances died. Penetration of the generative tissue may occur laterally through the leaf bases or vertically through young leaves.

Bacteria resembling *Bacillus coli* (Escherich) Migula, regarded by Johnston[5] as the cause of bud rot in Cuba, were isolated from diseased buds. Inoculations demonstrated the inability of the bacteria to penetrate healthy mature palms. When injected into wounds the resulting decay could not be distinguished from that which occurred in the wounded checks.

High precipitation, at least during a few months of the year, is considered the most important factor in the development of epidemics of bud rot.

Eradication of diseased palms has been found efficacious in reducing the incidence of the disease in an experimental grove.

C. M. TUCKER

PORTO RICO AGRICULTURAL EXPERIMENT STATION,
MAYAGUEZ, PORTO RICO

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

ADDITIONAL REPORTS ON THE FIFTH WASHINGTON MEETING

IT was planned that reports of all sections and societies that met with the American Association at Washington should be published together in the special enlarged issue of SCIENCE for February 6, but when the reports were assembled they were found to overrun the available number of pages. It seemed best to meet this difficulty by including in the special issue only reports bearing on the association as a whole, reports for the several section organizations themselves and reports for a few societies in fields that are related to a number of sections or to scientific thought in general. The remaining reports are to appear in later issues of SCIENCE and the first installment is published below. The reports are to be arranged in the order of the entries of the societies in the general program of the meeting, in groups corresponding to the several sections of the association to the fields of which they are most closely related.

A complete list of the scientific organizations that met with the association at Washington follows, in the order mentioned above: (A) The American Mathematical Society, The Mathematical Association of America and the Pi Mu Epsilon Fraternity. (B) The American Physical Society and the American Meteorological Society. (D) The American Astronomical Society and the International Astronomical Union. (E) The Association of American Geographers and the National Council of Geography Teachers. (F) The American Society of Zoologists, the Entomological Society of America and the American Association of Economic Entomologists. (G) The Botanical Society of America, the American Phytopathological Society, the American Society of Plant Physiologists, the American Fern Society and the Wild Flower Preservation Society. (F–G) The American Society of Naturalists, the Ecological Society of America, the American Microscopical Society, The American Nature-Study Society, the Phi Sigma Biological Society and the Genetics Sections of the American Society of Zoologists and the Botanical Society of America. (H) The American Anthropological Association and the American Folk-Lore Society. (I) The American Psychological Association. (K) The Metric Association and the American Political Science Association. (Reports of both these organizations have been published in SCIENCE for February 6.) (L) The History of Science Society. (Report already published, as above.) (N) The Society of American Bacteriologists, the Annual Conference of Biological Chemists and the Federation of American Societies for Experimental Biology. (The report for the Federation in general has been published, as above, but reports for the four constituent societies are still to appear. These societies are: The American Physiological Society, the American So-

[1] Delacroix, G., and Maublanc, C., 1909, "Les Maladies des Plantes Cultivées dans les Pays Chauds. Maladies du Cacaoyer." "L'Agriculture Pratique des Pays Chauds," 9: 314–318.

[2] Rosenbaum, J., 1917, "Studies of the Genus Phytophthora," *Journ. Agr. Research*, 8: 233–276.

[3] Reinking, Otto A., 1923, "Comparative study of *Phytophthora faberi* on coconut and cacao in the Philippine Islands," *Journ. Agr. Research*, 25: 267–284.

[4] Ashby, S. F., 1921, "Relation between cacao pod rot and coconut bud rot," *Agricultural News*, Barbados, 20: 318.

[5] Johnston, John R., 1912, "The history and cause of the coconut bud rot," U. S. D. A., Bur. Pl. Ind., Bull. 228, p. 1–175.

ciety for Pharmacology and Experimental Therapeutics, the American Society of Biological Chemists and the American Society for Experimental Pathology.) (O) The American Society of Agronomy, the Society of American Foresters, the American Society for Horticultural Science, the Association of Official Seed Analysts, the Potato Association of America, the Crop Protection Institute and the Geneticists Interested in Agriculture. (Q) The Phi Delta Kappa Education Fraternity. (X) The Society of Sigma Xi, the American Association of University Professors, the Gamma Alpha Graduate Scientific Fraternity and the Sigma Delta Epsilon Graduate Women's Scientific Fraternity. (Reports for these have been published, as above.)

BURTON E. LIVINGSTON,
Permanent Secretary

THE MATHEMATICAL SOCIETIES AT THE WASHINGTON MEETING

(A report for Section A appeared in SCIENCE *for February 6)*

The American Mathematical Society

President, G. D. Birkhoff.

Secretary, R. G. D. Richardson, Brown University, Providence, R. I.

(Report by R. G. D. Richardson)

The American Mathematical Society held its thirty-first annual meeting from Monday to Thursday, inclusive. The sessions on Monday afternoon and Tuesday morning and afternoon were devoted to the reading of short papers. Joint sessions were held on Wednesday morning with the Mathematical Association of America and Section A of the American Association for the Advancement of Science and on Thursday morning with the Mathematical Association and Sections A, B and D. The following trustees, officers and other members of the council were elected: *President,* G. D. Birkhoff; *vice-president,* G. C. Evans; *assistant secretary,* Arnold Dresden; *member of editorial committee of the Bulletin,* E. R. Hedrick; *member of editorial committee of the Transactions,* H. H. Mitchell; *members of the council,* G. A. Campbell, E. W. Chittenden, A. J. Kempner, H. E. Slaught, Virgil Snyder; *trustees,* G. D. Birkhoff, L. P. Eisenhart, W. B. Fite, Robert Henderson, R. G. D. Richardson.

The Mathematical Association of America

President, H. L. Rietz.

Secretary-Treasurer, W. D. Cairns, Oberlin College, Oberlin, Ohio.

(Report by W. D. Cairns)

The Mathematical Association held its ninth annual meeting on Wednesday and Thursday, with an attendance of 268. The following officers for 1925 were elected or appointed: *President,* J. L. Coolidge; *vice-presidents,* A. A. Bennett and Dunham Jackson; *trustees for three years,* R. C. Archibald, L. P. Eisenhart, E. V. Huntington and H. L. Rietz; *secretary-treasurer,* W. D. Cairns; *representatives in Council of A. A. A. S.,* W. D. Cairns and T. M. Focke. Fifty-one individuals and two institutions were elected to membership, the association now numbering 1,740 individual and 109 institutional members. The financial report showed a small balance for the fiscal year. The trustees voted to hold the next two annual meetings at Kansas City and Philadelphia, to approve the organization of a Southern California Section, the sixteenth section of the association, and to approve a very favorable arrangement made by Mrs. Mary Hegeler Carus to further the publication of the Carus Monographs.

The separate program of the association consisted of seven papers, as follows:

Outlines of fields of research: the mathematics of finance: G. C. EVANS, Rice Institute.

Outlines of fields of research: general analysis: T. H. HILDEBRANDT, University of Michigan.

On the empirical representation of certain production curves: C. E. VAN ORSTRAND, U. S. Geological Survey.

Preliminary report of the committee on standard departments of mathematics in colleges: R. D. CARMICHAEL, University of Illinois.

Application of Ritz's method to practical problems in engineering: WILLIS WHITED, Pennsylvania State Department of Highways.

Browse: a course in scientific literature: BESSIE I. MILLER, Rockford College.

New conformal world maps derived from elliptic functions: DR. O. S. ADAMS, U. S. Coast and Geodetic Survey.

Sections A, B and D met in joint session Thursday morning with an attendance of 250, Professors W. F. G. Swann and J. A. Miller presiding in turn. Professor H. N. Russell, of Princeton University, spoke on "Stellar evolution," giving a classification of stars according to brightness and color. He pointed out how the plotting of the surface temperatures against the amount of light emitted gives definite clusterings on the diagram, running in what Eddington calls the main sequence from hot white stars to cooler red stars but with a branch composed of the giant stars for which brighter light is accompanied by lower temperature. It was explained how the consideration of inner temperature, rate of radiation of heat and radioactive changes, with the con-

vertibility of mass and energy, are at present used to account for the evolution of the stars which is implied in the diagram above referred to.

As the representative of the Mathematical Association, on the joint program, Professor Archibald Henderson, of the University of North Carolina, spoke on the subject, "Is the universe finite?" He mentioned the incredibility to the average person of the results of recent cosmogony, sought to add to the Einstein theory a reasonable hypothesis based on the mean density of the universe and to collate the recent estimates of the consequent radius of the universe. Exceedingly different methods of approach give agreements in the value of this radius, which are gratifying considering the profound difficulty and complexity of the problem. The results must be interpreted either as wholesale errors or as the relativistic consequence of the curvature of space.

The Pi Mu Epsilon Mathematical Fraternity

Director general, E. D. Roe, Jr.

Secretary general, Warren G. Bullard, 117 Redfield Place, Syracuse, N. Y.

(*Report by W. J. Bullard*)

The Washington Convention of Pi Mu Epsilon brought together delegates from the several chapters to discuss matters of vital import to the fraternity and to coordinate and unify the chapters. The fraternity was revealed as in a flourishing state, with nine chapters at present. The convention closed with a dinner that was much enjoyed by the delegates.

PHYSICAL SOCIETIES AT THE WASHINGTON MEETING

(*A report for Section B appeared in* SCIENCE *for February 6*)

The American Physical Society

President, Charles E. Mendenhall.

Secretary, Harold W. Webb, Columbia University, New York, N. Y.

(*Report by S. R. Williams*)

The 130th meeting of the American Physical Society was held from December 29 to 31, 1924, in the Bureau of Standards. Professor Charles E. Mendenhall, of the University of Wisconsin, presided at the meetings. The equipment and arrangements for projecting the slides of the various speakers were excellent. About 225 persons were present and about 80 papers were read. The following officers of the society were elected: *President,* D. C. Miller; *vice-president,* K. T. Compton; *secretary,* H. W. Webb; *treasurer,* G. B. Pegram; *members of Council,* F. C. Blake and W. F. G. Swann; *members of board of editors of Physical Review,* K. K. Darrow, E. C. Kemble and F. L. Mohler.

The program for Tuesday morning was specially interesting on account of a group of papers bearing on the Compton Effect. The Tuesday afternoon session was held jointly by the American Physical Society with Sections B and D of the American Association for the Advancement of Science and with the American Astronomical Society.

The American Meteorological Society

President, Willis I. Milham.

Secretary, Charles F. Brooks, Clark University, Worcester, Mass.

(*Report by Charles F. Brooks*)

The fifth anniversary meeting of the American Meteorological Society was fittingly held at the center of American meteorological activity, in the U. S. Weather Bureau. In numbers of sessions and papers presented this meeting exceeded all previous ones. One entire session was devoted to an aerological symposium centering around a discussion of the late Dr. C. LeRoy Meisinger's contribution to meteorology, the unsolved problems left by him, and the use of the growing Meisinger Aerological Research Fund to stimulate investigation in that field. The president of the society was made *ex-officio* chairman of the Meisinger Fund Committee and the chairman designated R. DeC. Ward, C. F. Marvin and W. R. Gregg as the other members of the committee. Plans for an international organization to make weather maps for the whole northern hemisphere were discussed and heartily endorsed. The presidential address, on "The year 1816—the causes of abnormalities," also treated of world meteorology, bringing out the essential rôle volcanic dust seems to have played in creating the low temperatures experienced at least in New England in the summer of 1816.

Of the 28 papers presented, four were concerned with instruments or methods, an outstanding paper being that on "The theory of the anemometer," by J. Patterson. Although the cup anemometer was invented 80 years ago we now for the first time have a thoroughly satisfactory and well-understood instrument that operates accurately through a wide range of velocities. Dr. V. Bjerknes, distinguished Norwegian meteorologist and author of the now well-known "polar front" theory of cyclones and anticyclones, described the simple means by which cyclones in the northern North Atlantic are designated by radio. Four papers on the physics of the air were presented, dealing with: Potential gradient during thunderstorms (Jensen), meteorology of eclipses (Clayton), fluid rotation (Vaughan) and variation of wind with height (Humphreys). Statistical meteorological studies included rainfall periodicities (Alter)

and rainfall distribution about the centers of tropical cyclones (Cline). Climatology was represented by five papers touching Hawaii, California, the United States and Trinidad. Applications of meteorology were discussed in five other papers, dealing with: The proportion of rainfall available for plant use (Voorhees), the effect of weather on fruit production (Kincer), the fruit-spray and harvest-weather forecasts of the Weather Bureau (Calvert), weather forecasts for long flights of airplanes and dirigibles (Thiessen and Anderson). A paper by C. F. Talman on "The vocabulary of weather and climate" was of general interest.

The officers elected for 1925 are: *President,* W. I. Milham, of Williams College; *vice-president,* A. E. Douglass, of the University of Arizona; *secretary,* C. F. Brooks, of Clark University; *treasurer,* W. R. Gregg, of the U. S. Weather Bureau; *councilors,* H. H. Clayton, W. M. Davis, W. J. Humphreys, Alexander McAdie and J. C. Millâs.

A more complete report of the meeting will appear in the January, 1925, *Bulletin* of the American Meteorological Society, and the papers and discussions will be published in full or in abstract in that journal or in the *Monthly Weather Review.*

THE AMERICAN ASTRONOMICAL SOCIETY AT WASHINGTON

(*A report for Section D appeared in* SCIENCE *for February 6*)

The American Astronomical Society

President, W. W. Campbell.

Secretary, Joel Stebbins, Washburn Observatory, Madison, Wis.

(*Report by Joel Stebbins*)

The thirty-third meeting of the American Astronomical Society was perhaps the largest gathering in the history of the society, the average attendance at the sessions being about one hundred and twenty-five. On Tuesday the meeting opened with a joint session with Section B and the American Physical Society. We shall let the Physics report give a proper appreciation of the retiring address of Vice-president Swann, of Section B; to the astronomers it was both informative and inspiring. The main astronomical contributions to the program were the retiring address of Dr. Heber D. Curtis, vice-president of Section D, and an address by Professor B. V. Bjerknes, of Bergen, Norway. Dr. Curtis chose for his subject "The equinox of 1950.0," which was largely in the nature of a prophecy of the state of astronomy some twenty-five years hence. His paper has been reported under Section D. In his address on "Solar hydrodynamics," Professor Bjerknes was able to give on the basis of currents in the sun a reasonable explanation of the peculiar distribution of sun-spots in the eleven-year period. The shorter papers on the program were all of interest to both astronomers and physicists.

Members of the society and friends were the guests of the U. S. Naval Observatory on Wednesday, through the courtesy of the superintendent, Captain E. T. Pollock, and special buses were provided for transportation. At the first session there were reports of the latest work at the observatory, such as improvements in the determination of time and its distribution. After the luncheon hour, the visitors were shown the different instruments of the observatory by members of the staff. As an illustration of the cordial cooperation of the Navy Department, in response to a suggestion by the astronomers made in the morning that special time signals would be very welcome on the day of the eclipse, January 24, 1925, it was promptly announced by Captain Pollock that arrangements had been made for broadcasting such time signals a half hour before and a half hour after the time of totality.

New Year's Eve marked a special epoch in the history of astronomy, which was observed in fitting manner by those present. Up to January 1 astronomers have begun their day at noon, but beginning with 1925, for the convenience of mariners, the data in the *Nautical Almanac* are given on the basis of civil reckoning, the day beginning at midnight. Astronomers generally will change to the new system, which of course does not affect the public, but will be the cause of considerable difficulty about observatories for some time to come. On Thursday morning there was a joint session with mathematicians and physicists, at which Professor H. N. Russell discussed the subject "Stellar evolution," and Professor Archibald Henderson "The size of the universe." These two themes gave rise to some spirited discussion, and in spite of an early start it was well past the noon hour when the meeting adjourned. On Thursday afternoon there was a symposium on preparations for observing the eclipse of January 24, perhaps the most striking announcement being that the naval airship *Los Angeles* will carry a party of astronomers from the Naval Observatory.

On Thursday evening occurred the annual astronomical dinner at the Hotel Powhatan, with impromptu speeches. On Friday morning Washington was pretty well snowed under, but the weather did not interfere with the meeting of the American Section, International Astronomical Union, at the National Research Council Building. Numerous committee reports were acted upon in preparation for the meeting of the Union which will be held at Cambridge, England, beginning July 14, 1925.